

**PRE-APPEAL BRIEF REQUEST FOR REVIEW**

Docket Number (Optional)

H0005645

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on \_\_\_\_\_

Signature \_\_\_\_\_

Typed or printed name \_\_\_\_\_

Application Number

10/628,085

Filed

07/24/2003

First Named Inventor

Dennice F. Gayme

Art Unit

3664

Examiner

Mancho, Ronnie M.

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reason(s) stated on the attached sheet(s).

Note: No more than five (5) pages may be provided.

I am the

☐ applicant/inventor.

/S. JARED PITTS/

☐ assignee of record of the entire interest.  
See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed.  
(Form PTO/SB/96)

Signature

S. Jared Pitts

Typed or printed name

☒ attorney or agent of record.  
Registration number 38579

(480) 385-5060

Telephone number

☐ attorney or agent acting under 37 CFR 1.34.  
Registration number if acting under 37 CFR 1.34 \_\_\_\_\_

August 12, 2009

Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required.  
Submit multiple forms if more than one signature is required, see below.

☒ \*Total of 1 forms are submitted.

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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Appl. No.	: 10/628,085	Confirmation No.	3521
Applicant	: Dennice F. GAYME et al.		
Filed	: July 24, 2003		
TC/A.U.	: 3663		
Examiner	: R.M. Mancho		
Docket No.	: H0005645-3026		
Customer No.	: 000128		

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**ARGUMENTS ACCOMPANYING PRE-APPEAL BRIEF REQUEST FOR REVIEW**

**I. Status of Claims**

Claims 1, 2, 5-7, 9-11, 21, 25, 26, 28-31, 33, 34, 36-45 are pending in this application, with Claims 1, 21, 31, and 39 being the independent claims, and claims 2, 21, 25 and 28-30 are withdrawn from consideration. In general, the claimed invention is directed toward a system for detecting faults in a turbine engine. The fault detection system includes a sensor data processor that receives engine sensor data during operation and augments the sensor data by generating residuals from the sensor data and determining a rate of change of the residuals. The augmented data set is received by a fuzzy logic inference system that includes a plurality of membership functions. The fuzzy logic system fuzzifies the augmented data set using the plurality of membership functions and analyzes the augmented data set to determine a likelihood that a fault has occurred in the turbine engine.

**II. Rejections under 35 U.S.C. § 103**

Claims 1, 5-7, and 9-11 were rejected under 35 U.S.C. § 103 as allegedly being unpatentable over U.S. Patent Publication No. 2003/0139860 to McBrien et al (hereinafter McBrien) in view of Wikipedia Encyclopedia. The Examiner stated that McBrien discloses a fault detection system for detecting faults in a turbine engine, where the fault detection system includes a sensor data processor providing an augmented data set and a logic inference system, the logic inference system analyzing the augmented data set to determine the likelihood that a fault has occurred. In making these rejections, the Examiner cited elements

12, 14 and 16 as disclosing a sensor data processor, and element 30 of FIG. 3 as disclosing a fuzzy logic inference system.

Applicants respectfully disagree, and submit that the claims are patentably distinct over the cited McBrien reference and Wikipedia entry for horsepower.

First, with regard to the sensor data processor, the Examiner again alleged that elements 12, 14 and 16 of McBrien constitute the recited sensor data processor, stating that these elements are configured to augment the sensor data by generating residuals and determining a rate of change of the residuals. Specifically, the Examiner now cites to McBrien teaching generating residuals in that “raw sensor data are filtered or conditioned thus forming residuals.” Next, the Examiner cites the McBrien as teaching a rate of change of the residuals in the form of a “horsepower which constitutes rate of change of work done”. Furthermore, in response to Applicants’ previous arguments, the Examiner now admits that “rate” is a form “ratio”, but states that because sensor data is shown as mapped in FIG. 5 and that graphs show a slope, that a rate of change has been determined.

Applicants again submit that this is a misreading of the McBrien reference, and that the McBrien reference fails to teach the recited sensor data processor.

First, with regard to “generating residuals”, applicants note the specification defines residuals as the difference between the sensor data and the expected values of the sensor data. Applicants submit that neither the cited “filtered” or “conditioned” sensor data meets the limitation of a generated “residual” as the term is used in applicant’s claims.

Second, with regard to determining a “rate of change of the residuals”, the fact that McBrien teaches the use of “horsepower” and includes graphs that show “slope” is clearly irrelevant. Specifically, the fact that FIG. 5 includes graphs that “therein show a slope, thus a rate of change” does not mean that McBrien actually teaches calculating such a rate of change of a residual. Instead, paragraph 0051 of McBrien makes clear that units 45a and 45b are performance maps developed by engine manufactures that are applied to conditioned values and multiplied. There is nothing in McBrien that even hints at units 45a and 45b being used to calculate any sort of rate of change of a residual.

Third, applicants again note that because “rate” is only a type of “ratio” (as apparently finally admitted to by the Examiner), it cannot be said that McBrien teaches the specific use of a “rate of change”, when it only refers to the general term of “ratio”.

Fourth, with regard to cited paragraph 0057 of McBrien, this clearly describes that the “horsepower deviation ratios” are calculated through division of horsepower terms. When horsepower is divided by horsepower, the result is a unit-less ratio. A unit-less ratio does not express a rate of change, because it does not have the units of change. See the equation in paragraph 0057.

Finally, if the Examiner is alleging that horsepower itself is a “rate of change” applicants again note that the claimed limitation is actually of a “rate of change of a residual”. As the Wikipedia reference (cited by the Examiner) states, the units of horsepower are “work over time”. “Work over time” cannot be said to be the “rate of change of sensor data residuals” because no “residual” was calculated in determining the horsepower before the “rate of change” was determined.

Applicants can thus find no teaching in McBrien where **residuals from sensor data** or the **rate of change of residuals from sensor data** is calculated. Applicants thus again submit that this part of the rejection is based on a misinterpretation of McBrien, and that the reference fails to teach the recited limitations.

Next, with regard to the fuzzy logic inference system and membership functions, the Examiner again alleged that element 30 of McBrien constituted these elements. Specifically, the Examiner now alleges that the “boxes with mathematical symbols” (elements 34 and 36) constitute the recited “membership functions”. Applicants again disagree, and submit that element 30 of McBrien does not include any sort of fuzzy logic inference system as claimed. While FIG. 3 of McBrien does label element 30 using the phrase “fuzzy logic calculations”, it is merely described as performing calculations relating to bypass, stopping or enabling the fault detection system. See FIG. 4 and paragraphs 0046-0048 of McBrien. For example, these sections describe how the element 30 determines if there are sufficient sensors available, and if not the fault detection logic is bypassed. Additionally, element 30 is described as determining the engine operating mode and likewise bypasses the fault detection logic if the engine is not in normal or combat roles. See paragraph 0047 of McBrien.

In contrast, applicants’ amended independent claims recite that the fuzzy logic inference system includes a plurality of membership functions and is configured to fuzzyify the augmented sensor data using plurality of membership functions. Specifically, independent claim 1 recites that the system fuzzifies the “residuals from the sensor data and

the rate of change of the residuals using the plurality of membership functions”. Applicants can find no teaching of any membership functions or the use membership functions on residuals from sensor data, or on the rate of change of residuals. Applicants note that elements 34 and 36 are merely described as simple “summers”. See paragraph 0046 of McBrien.

As McBrien fails to teach a sensor data processor or fuzzy logic inference system as claimed, applicants submit that independent claim 1 is patentably distinct over McBrien. Furthermore, as claims 5, 6, 7, 9, 10 and 11 depend from, and include all the limitations of independent claim 1, they are also submitted to be patentably distinct.

Claims 31, 33, 34, 36-38 were rejected under 35 U.S.C. § 103 as allegedly being unpatentable over McBrien in view of Martucci (U.S. Patent No. 6289274) and in further view of the Wikipedia document. Applicants again disagree, and submit that amended independent claim 31 is patentably distinct over the cited references for similar reasons as was expressed with respect to claim 1. Specifically, the Martucci reference was simply cited as teaching a processor, and the reference thus does not overcome the deficiencies in McBrien noted above. Furthermore, as claims 33, 34 and 36-38 depend from, and include all the limitations of claim 31, they are also submitted to be patentably distinct.

Claims 39-45 were rejected under 35 U.S.C. § 103 as allegedly being unpatentable over McBrien in view of Brown et al (U.S. Patent No. 5377112). With regard to McBrien, this rejection is based on the same rational as that given with respect to claim 1. With regard to Brown, the Examiner relies on Brown to teach sensor data that includes exhaust gas temperature data, engine speed data, and fuel flow data, and the generating of residuals of these data types. Because this rejection relies on the same rational with respect to McBrien that was used to reject claim 1, applicants submit that it fails for the same reasons.

Furthermore, applicants submit that McBrien further fails to teach the specific limitations of claim 39. For example, McBrien does not teach a fuzzy logic system that is “configured to fuzzify the exhaust gas temperature residuals, the engine speed residuals, the fuel flow residuals, the rate of change of the exhaust gas temperature residuals, the rate of change of the engine speed residuals, and the rate of change of the fuel flow residuals **using the plurality of membership functions**” (emphasis added). Again, applicants note that the Examiner merely sites summers as being membership functions, but did not cite any

particular portion of McBrien as teaching the use of membership functions with regard to the specific residual types and residual rate of changes.

As McBrien fails to teach a sensor data processor or fuzzy logic inference system as claimed, applicants submit that independent claim 39 is patentably distinct over McBrien and Brown. Furthermore, as claims 40-45 depend from, and include all the limitations of independent claim 39, they are also submitted to be patentably distinct.

Furthermore, with regard to claims 40 and 41, no part of either reference is seen as teaching low membership functions, high membership functions, medium membership functions, or any membership functions that comprise a first sigmoid function, a trapezoid function, or a second trapezoid function. Again, the only elements cited as membership functions appear to be summers.

With regard to claim 43, no part of either reference is seen as teaching the calculation of a centroid under the aggregated output function.

Based on the above, independent Claims 1, 31 and 39 are patentable over the citations of record. The dependent claims are also submitted to be patentable for the reasons given above with respect to the independent claims and because each recite features which are patentable in its own right. Individual consideration of the dependent claims is respectfully solicited.

### **III. Conclusion**

In view of the foregoing, it is submitted that the Examiner's reliance upon McBrien does not support rejection of claims and that the above-noted rejections should be withdrawn.

Respectfully submitted,  
INGRASSIA FISHER & LORENZ

Dated: August 12, 2009

By: /S. JARED PITTS/  
S. Jared Pitts  
Reg. No. 38,579  
(480) 385-5060